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races. Is it not possible that there is a basis of truth in the old Cherokee tradition? That a party of Spanish explorers—and perhaps more than one—penetrated Western Carolina in search of gold, silver and other minerals, and, in some instances, finding the old mines of the Mound-builders, caused preliminary investigations of their value, does not seem improbable. In Cherokee county are found "prospect holes" excavated with far greater skill than that of savage or barbaric miners.[1] To what expedition these Europeans belonged, is a mystery. That of De Soto, according to the course traced out by Bancroft, passed within a comparatively short distance of North Carolina—especially the south-western corner—as it crossed from the head waters of the Savannah or Chattahouchee to those of the Coosa. From it an exploring party was sent to the north, which returned disheartened—without the precious gold—reporting the mountains impassable.[2] Could the work have been done by stragglers from this or other parties, or have there been special expeditions to this region of which the historian has lost sight?

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ON THE FERTILIZATION OF CALAMINTHA NEPETA.

BY WILLIAM TRELEASE.

DURING the past summer my attention was several times drawn to this little plant, in the vicinity of Washington, by the large number of insects collected about the flowers, and a more careful examination revealed the following facts about the species.

The stem, leaves, calyx and corolla are furnished with a fine pubescence, which may prevent small and undesirable insects, like ants, from wandering over the plant, for a coating of this sort often proves insurmountable to these tiny creatures. In the throat of the persistent calyx is a whorl of stiff hairs that may serve as a protection for the young corolla and the essential organs before they are protruded from the calyx; and after the corolla has fallen away, the maturing ovary may likewise, perhaps, be protected against certain enemies.

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[1] One of the most remarkable of these is a *timbered shaft* 100 feet deep on Valley river. See Rept. of Progress Geol. Survey N. C., 1869, p. 56.

[2] History of the United States. Bancroft. 13th edition. Vol. 1, pp. 47–48.

A well developed fleshy outgrowth of the receptacle secretes an abundance of nectar which collects about the ovary in the lower part of the flower.

The lower lip of the corolla, near its base, is sparsely beset with long, stiffish hairs (*h*). Two large purple spots on its middle lobe and close to the median line (*m*), and several smaller ones (*m'*) at the mouth of the corolla tube, clearly indicate the way to the nectar concealed within, while a deep guiding groove (*g*), bounded on either hand by ridges of stiff hairs (*h'*), leads directly beneath the four anthers (*a*) that converge in pairs close beneath the upper lip of the corolla.

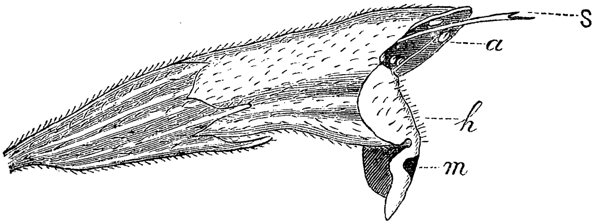

FIG. 1.

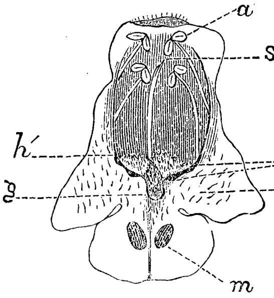

FIG. 2.

FIG. 1.—Old flower of *Calamintha nepeta*, seen from the side. FIG. 2.—Younger flower from in front. The figures are enlarged seven diameters; *a* indicates the anthers; *g*, the guiding groove; *h*, the protecting hairs of the lower lip; *h'*, the ridges of hairs bordering the guiding groove; *m* and *m'*, the nectar marks; *s*, the stigma.

On the expansion of the flower, the anthers shed their pollen. At this time the style is of such a length as to bring the stigma into the middle of the quadrilateral whose angles are occupied by the anthers, but its two lobes (Fig. 2, *s*) are now closely pressed together, and immature. In this stage the flower is, therefore, staminate, only, as regards function. After the unfolding of the corolla, the style gradually elongates and its summit passes close below the outermost pair of anthers, even brushing them in many instances; but very little pollen seems to be carried away by the still appressed lobes of the stigma. When the latter has become somewhat exserted (Fig. 1, *s*) its lobes expand, and are now ready for fertilization, and as some pollen still remains in the anthers, the flower is now properly hermaphrodite or perfect. The stigma, however, retains its freshness for some time, and meanwhile the remainder of the pollen may have been removed, leaving the flower pistillate in function.

If, now, an insect in search of nectar is attracted to the flower, the purple blotches or nectar marks catch its eye and lead it directly to the mouth of the corolla, its head or back usually coming in contact with the receptive face of the stigma if this is already mature. The dense *chevaux-de-frise* of hairs, however, prevent it from entering unless it be large enough to effect the transportation of pollen in return for the food obtained; but if sufficiently large and strong to pass these, and not too large to creep into the flower, it enters, finding it far easier to follow the guiding groove than to pass over the bristles on either hand. Pushing in a sufficient distance to obtain the desired food, its back rubs against the anthers, or what is equally effective, its sides shaking the filaments, bring down a shower of pollen. Having exhausted the supply of nectar in the first flower, it flies to another, then to a third, carrying pollen from one to the other. Several species of Halictus[1] and *Calliopsis andreniformis* Sm., were seen to visit the flowers in this manner.

If, on the other hand, the insect be too large to force its way into the corolla, it alights on the lower lip, usually clasping the side of the tube with two or more of its feet, and thus steadying itself, while its head is thrust into the flower as far as possible, and its tongue is extended to reach the nectar. Though the *modus operandi* is different, the result is the same as in the last case, with an exception which will be mentioned later. The flowers are visited in this way by the following insects: Hymenoptera—*Apis mellifica* L., *Bombus virginicus* Oliv., *B. fervidus* Fab., *Xylocopa virginica* Drury (♀ and ♂), *Megachile brevis* Say, *M. latimanus* Say, *Anthidium cognatum* Cres., *Ammophila vulgaris* Cres., *Bembex fasciata* Fabr., and *Myzine 6-cincta* Fabr. Lepidoptera—*Colias philodice* God., *Pieris rapæ* L., *P. protodice* B. and L., *Papilio asterias* Drury?, *Junonia cœnia* B. and L., *Hesperia hobo-*

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[1] The Hymenoptera were all kindly identified by Mr. E. T. Cresson.

mok Harris?, *H. tessellata* ?, *Lycæna comyntas* Harris?, and two species of Nyssoniades. Coleoptera—*Chauliognathus pennsylvanicus* DeGeer. In addition to these a fly, *Mesograpta marginata* Say.,[1] and one of the species of Halictus mentioned above, were found in considerable numbers collecting pollen from the anthers of young flowers, in doing which they undoubtedly often carry the pollen of one flower to the stigma of another.

Of these insects the species most common in this connection are *Apis mellifica, Bombus virginicus* and *Chauliognathus pennsylvanicus,* all of which may be counted by thousands on a bright sunny day about the first of September in places where the plant grows abundantly; and it is upon them, chiefly, that the fertilization of the flowers is dependent. Some of the Lepidoptera, especially *Pieris rapæ,* are very often seen sipping the nectar of the basil thyme, but from the length of their proboscides they can easily reach the bottom of the corolla without inserting their heads into its throat, and I am inclined to believe that their efficiency in the transfer of pollen is not very great. A noctuid moth, apparently belonging to the genus Prodenia was also very abundant, but in obtaining the nectar it did not rest upon the flower like the species enumerated above, but hovered before it, steadying itself with its fore feet as I have seen *Heliothis armigera* do when feeding upon the involucral nectar of Gossypium. Though I was somewhat surprised to find a noctuid thus engaged at midday, I find that Harris[2] records the habit as not uncommon to certain Agrotids, and it is probably well known to all entomologists.

From what precedes, it may be seen that the nectar of this Calamintha attracts many insects belonging to a considerable number of species, and that the majority of these—in individuals if not in species—readily obtain the sugared fluid, in doing which they encounter the stigma and anthers of the flower—the former (if mature) in entering, the latter before leaving it.

The development of the flowers is such that the self-fertilization of a given flower appears possible in but two ways: 1. Pollen may be taken up by the longer (lower) lobe of the immature stigma as the latter passes below or between the anthers during the elongation of the style, and remaining there, and retaining its virility till the stigma matures, it may then emit its tubes and fecundate the ovules. 2. An insect dusted with the pollen of a flower may revisit the same flower, leaving some of its burden on the stigma; or it may possibly deposit freshly gathered pollen on the stigma as it leaves the flower, but from the position of the stigmatic surface this is not likely to happen. Ordinarily, however, any flower will be fertilized by pollen from another, though from the irregularity with which insects visit the flowers of these straggling plants, this is as likely to belong to the same stock as to a different one.

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[1] Identified by Mr. Edward Burgess.

[2] Insects Injurious to Vegetation (Flint edition), p. 441.

In closing, it may not be out of place to offer a brief comparison of this species with others of the large family of mints to which it belongs. In this order, nectar is usually secreted—as in the present instance—by a prominent gland that, closely adjoining the ovary, is usually more or less prominently four-lobed, portions of it filling the angles between the lobes of the latter organ. Proterandry, or the maturity of the stamens before the pistil, is the rule, and is sometimes correlated with motions, due to the growth of the parts, by which the anthers and stigma at maturity successively occupy the same place with reference to the other parts of the flower. In some cases strongly marked proterandry, leading to invariable cross-fertilization, has caused the origin of forms with smaller flowers in which the anthers are entirely abortive, so that the species becomes gyno-dioecious. This is the case, for example, with the related *Calamintha clinopodium*.[1] But a careful examination of the species under discussion did not reveal a similar peculiarity in this case, though further observation, and especially over a more extended territory, may, perhaps, reveal something of the sort. According to Dr. Müller, l.c., *C. clinopodium* is visited for its nectar by two lepidopterous insects, *Pieris brassicæ* L., and *Satyrus hyperanthus* L.; and *Calamintha acinus* is visited for nectar and pollen by the hive bee, and for nectar by a bombyliid fly, *Systœchus sulfureus* Mik. From the floral structure of the basil, which is quite common in parts of our own country, one would expect its most frequent visitors to be Hymenoptera, and this is supported by what we know of the visitors of *C. nepeta;* and if so, it is probable that careful examination where numbers of the plants grow in company will reveal the hive bee as among the more frequent.

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[1] Dr. H. Müller, Befruchtung der Blumen, 1873, p. 325.